Claims:

1. A method of producing a peptide or protein expression library which displays a diverse population of peptides or proteins, wherein the peptides or proteins are specifically associated with the DNA encoding them through covalent protein:DNA binding, said method comprising at least the following steps:

1) preparing an amplifiable genetic library of DNA molecules which contain a nucleotide sequence encoding an amino acid sequence which binds specifically to said encoding sequence through covalent protein:DNA binding (binding moiety), a sequence encoding an amino acid sequence for display (display moiety), and at least one site of attachment for the binding moiety, and

2) expressing the genetic library thus formed.

2. A method as claimed in claim 1 wherein expression of the genetic material is performed in vivo with a single library member, optionally present in more than one copy, expressed per host cell or organism.

3. A method as claimed in claim 1 wherein said amino acid sequence which binds specifically to said encoding sequence is derived from a cis-acting protein or a functionally-equivalent fragment, variant or derivative thereof and expression of the genetic material is performed in vivo with at least one library member, optionally present in more than one copy, expressed per host cell or organism.

4. A method as claimed in claim 1 wherein said amino acid sequence which binds to said encoding sequence is derived from a cis-acting protein or functionally-

equivalent fragment, variant or derivative thereof and expression of the genetic material is performed in vitro.

5. A method as claimed in claim 3 ~~or 4~~ wherein said *cis*-acting protein is the P2 A protein.

6. A method as claimed in claim 4 ~~or 5~~ wherein said expression is performed in the presence of a mis-match oligonucleotide which hybridizes to the DNA adjacent to the attachment site on both sides but does not hybridize in the region corresponding to the attachment site.

7. A method as claimed in ~~any one of claims 1 to 6~~ wherein said amino acid sequence for display is up to 40 amino acid residues.

8. A method as claimed in ~~any one of claims 1 to 7~~ wherein said amino acid sequence for display is generated by, or comprises DNA fragments from, cloning.

9. A method as claimed in ~~any one of claims 1 to 8~~ wherein said binding moiety is modified such that the binding moiety remains covalently attached to said encoding DNA.

10. A method as claimed in claim 9 wherein said binding moiety is derived from P2A which has been modified by replacement of tyrosine at amino acid position 450 with phenylalanine.

11. An in vitro peptide expression library produced according to the method of ~~any one of claims 1 to 10~~.

12. A DNA molecule containing a DNA sequence encoding a peptide or protein for expression in a library according to claim 11, containing a sequence encoding an amino acid sequence which binds specifically to said encoding

sequence through covalent protein:DNA binding (binding moiety), a sequence encoding an amino acid sequence for display (display moiety) and at least one site of attachment for the binding moiety, and degenerate and/or functionally equivalent sequences.

13. A DNA vector containing a DNA sequence as claimed in claim 12.

14. A method of identifying and/or purifying a library member exhibiting desired properties from a peptide or protein expression library as defined in claim 11, comprising at least the steps of a) screening a library as defined in claim 11, and b) selecting and isolating the relevant library member.

15. A method of identifying a specific target-binding peptide or protein, said method comprising at least the steps of a) screening a library as claimed in claim 11 with target molecules and b) selecting and isolating a library member binding to said target molecule and c) isolating the peptide or protein which binds specifically to said target molecule.

16. A method as claimed in claim 15 wherein additionally the DNA expressing the peptide or protein which binds specifically to said target molecule is isolated.

17. A method of assaying for the presence of a target molecule in a sample, said method comprising (a) contacting said sample with a molecular probe comprising (i) a peptide or protein target-binding moiety capable of selectively binding to said target molecule, with attached encoding DNA, the DNA moiety, selected from the library as claimed in claim 11 and (ii) a reporter moiety; and (b) directly or indirectly assessing the target bound probe.

18. A bifunctional molecular probe for use in the assay method according to claim 17 comprising (i) a peptide or protein moiety capable of selectively binding to a target molecule, with attached encoding DNA, the DNA moiety, selected from the library as claimed in claim 11 and (ii) a reporter moiety.

add B3

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